

Commonwealth of Kentucky
Division for Air Quality
PERMIT STATEMENT OF BASIS

Draft Permit
Title V, Construction / Operating
Permit: V-03-026 R1
Kentucky Hydrocarbons, Inc.
Langley, KY 41645
April 24, 2007
Sukhendu K. Majumdar, Reviewer
SOURCE ID: 21-071-00140
SOURCE A.I. #: 38048
ACTIVITY ID: APE20070001

SOURCE DESCRIPTION:

On February 26, 2007, the permittee applied to the Division for the construction/operation of a new natural gas liquid (NGL) plant at the existing Langley, Kentucky site. The new NGL plant will consist of the NGL extraction system and associated equipment. The NGL process will be used to segregate NGL components (i.e., propane, butane, pentane, and other residual components) from natural gas received at the facility. Equitable Production Company (Equitable), d.b.a. Kentucky Hydrocarbon, Inc., currently operates natural gas compression units that pressurize natural gas entering the facility via pipelines. The pressurized natural gas stream is liquefied and segregated into NGL components in an existing NGL extraction plant, which is owned and operated by MarkWest Hydrocarbons, Inc. (MarkWest).

Natural gas is piped to the Langley facility from wells in the Eastern Kentucky region. This natural gas stream can contain a variety of NGL components, including C1 – C5+ hydrocarbon compounds. The input natural gas stream is compressed to high pressure in the compression engines. The gas compression system consists of a turbo expander, a refrigerant compressor, five natural-gas fired Cooper-Bessemer compressors, and one electrically-driven compressor. The expander drives the centrifugal inlet gas compressor, which boosts the inlet gas from 68 psig to 86 psig prior to compression by the existing Cooper-Bessemer compressors. The final pressure of the gas stream is increased to approximately 530 psig in the five Cooper-Bessemer compressors. The higher suction pressure to the reciprocating compressors enables them to handle up to approximately 70 million standard cubic feet per day (scfd) of gas.

The NGL extraction plant process is used to separate the useful NGL components from the natural gas stream. The three common types of processes to recover NGLs that are currently used in the natural gas processing industry are: refrigeration, lean oil absorption, and cryogenic. Refrigeration plants have the least capital cost but also have lower NGL product yields. This process can extract a large percentage of propane and most of the C₄+ gases and uses the least amount of fuel, compared to the other processes. The NGLs extracted from this type of plant are lower in vapor pressure and can be directly shipped off-site via trucks or can be transported via pipelines. Lean oil absorption plants can extract 90%+ of the C₃+ components in the gas stream and about 30% of the ethane by bubbling the gas through a chilled absorption oil operating at approximately –30°F. The fuel consumption of this type of plant is higher than that of the refrigeration plant. Cryogenic plants became prevalent in the last three decades when technology enabled higher ethane recoveries and

demand for feedstock increased to feed the plastics and petrochemical industries. These cryogenic plants could extract up to 70% of the ethane from the input gas stream, leaving a gas that was 90+% methane with the remainder being ethane and inert gases. High capacity compressors and refrigeration systems are required in a cryogenic extraction set-up.

Proposed Construction Project:

Equitable is proposing to construct a new NGL plant at the Langley facility. The new NGL plant will consist of the NGL extraction system and associated equipment. The new extraction plant will be similar to the existing extraction plant operated by MarkWest. However, the proposed extraction plant will be of a cryogenic type. The new system will also consist of an expander and compressor as part of the refrigeration system. This will result in higher refrigeration capacity and recovery efficiencies. All components of the NGL plant will be closed units with no emissions to the atmosphere. The only emissions from the proposed modification will be from the fugitive components.

There will be two new inlet gas compressors that will compress the inlet gas to a desired pressure for further processing in the new NGL extraction plant. In addition, three new gas compressors will be installed to provide the pressure needed to distribute the product gas stream from the plant to the pipeline. These compressors will be driven by electric motors and thus there will be no fuel combustion emissions associated with these units. The potential VOC emissions from each fugitive equipment type are calculated and summed to obtain the total potential VOC emissions for the new extraction system.

Currently, the unwanted ethane in the liquid product from the deethanizer column is vaporized directly into the residue gas. Therefore, the deethanizer column currently acts as a reject column. After the proposed modification, the deethanizer column will be able to recycle the vent stream to the new extraction system for NGL product separation.

NGL recovered products are currently shipped out by tanker trucks at an existing product loading rack equipped with one loading point and a vapor recovery system. The vapor recovery system is capable of collecting and returning discharged hydrocarbon vapors and gases associated with the loading of organic liquids into transport vessels back to storage tanks on-site, or into the compression process cycle. Negligible fugitive emissions emanate from the residual vapors in the end hose pipe disconnected from the tanker truck during loading. Since there are negligible and unquantifiable fugitive emissions from the vapor recovery system, this emission point was not previously defined in the existing Title V permit. As part of the proposed modification, a second loading point will be added to the existing loading rack. Apart from the residual emissions from the end hose pipe, there will be no fugitive emissions from the loading rack. Therefore, the fugitive emissions from loading rack will continue to be negligible since the existing vapor recovery system will also capture emissions from the second loading point.

One new natural gas fired regenerative heater will also be installed as part of the new NGL extraction unit. The maximum heat input capacity of the heater will be 15 mmBtu/hr.

Two new identical pressurized horizontal storage tanks will be constructed at the Langley facility as part of the project to hold NGL product. Each tank will have a storage capacity of 30,000 gallons. The length and internal diameter of each tank will be 57 ft and 9 ft, respectively. Since the tanks

will be pressurized, there will be no emissions to ambient air associated with the tanks under normal operating scenario. Therefore these tanks are listed as insignificant activities in the permit.

Source Classification:

Under the PSD and Title V program incorporated into Kentucky's State Implementation Plan (SIP), a single stationary source, defined in terms of a "building, structure, facility or installation" means all the pollutant emitting activities that:

- ▲ Belong to a single major industrial grouping;
- ▲ Are contiguous or adjacent; and
- ▲ Are under common control or ownership. [401 KAR 51:017, Section 1 (29) and (233) and 401 KAR 52:001, Section 1 (65)]

A stationary source is classified according to the primary activity at the location, which is determined by the principal product (or group of products) produced or distributed, or by the services it renders.

Equitable's natural gas compression facility and MarkWest's NGL extraction facility have the same two-digit SIC code, 1321 (Oil and Gas Extraction, Natural Gas Liquids). The Equitable and MarkWest facilities operate contiguously. Hence, the Equitable and MarkWest facilities are classified as a single source under both the PSD and Title V permitting programs.

The Division issued two separate Title V permits to Equitable and Markwest to reflect different names and control of process equipment. The Division stated that the two facilities will be individually responsible for compliance in their respective portions of the site unless there is a joint cause for the non-compliance. The combined emissions from both facilities are evaluated for PSD and Title V permit applicability purposes. Refer to *Regulations Not Applicable* section below for PSD non-applicability to the proposed modification.

COMMENTS:

Type of Control and Efficiency:

The Langley facility has one natural gas-fired flare that controls emissions from releases of compressor seals, pump seals, and regenerative gas scrubbers. The inlet gas compressor seals that are hard piped to the flare do not vent to the flare under normal operating scenario. When the compressors are shut down, a portion of gas in the machine and associated piping and equipment are vented to the flare. Similar venting occurs when the compressors are restarted. The design efficiency of the flare is 98% and it operates in compliance with the applicable provisions specified in 40 CFR 60.18, General Control Device requirements, and 401 KAR 63:015, Flares. Fugitive emission units in the NGL recovery system are also vented to the flare to comply with NSPS Subpart KKK and NSPS Subpart VV requirements. The flare will also be modified as part of source modifications at the Langley facility. Since the flare is owned by MarkWest, detailed discussion on flare modifications, emissions calculations, and applicable regulations is provided in the Statement of Basis for MarkWest's Title V permit [Ref. V-03-027R1].

Emissions Documentation:

Fugitive Emissions from NGL Plant

The proposed NGL plant will consist of the following fugitive emission components - 1,965 flanges, 1,237 valves, 1,207 connectors, 36 pressure relief valves, 16 pump seals, 8 compressors, and 8 open ended lines. To determine the VOC PTE of the new plant, the maximum number of components and the oil and gas production operations average emission factors for individual equipment types are utilized. The emission calculation methodology for the flanges is presented below as an example. VOC emissions from other fugitive equipment types will be calculated using a similar methodology:

$$\text{VOC}_{\text{Flanges}} [\text{lb/hr}] = \text{Emission Factor} \left[\frac{\text{kg}}{\text{hr.flange}} \right] \times \text{Number of Flanges} \times 2.2046 \left[\frac{\text{lb}}{\text{kg}} \right]$$
$$\text{VOC}_{\text{Flanges}} [\text{tpy}] = \text{VOC}_{\text{Flanges}} [\text{lb/hr}] \times 8,760 \left[\frac{\text{hr}}{\text{yr}} \right] \times \frac{1}{2,000} \left[\frac{\text{ton}}{\text{lb}} \right]$$

Regeneration Gas Fired Heater

AP-42 emission factors are used to calculate natural gas combustion emissions for the regeneration heater. Natural gas is the only fuel that will be used in the heater. The potential emissions from natural gas combustion are calculated by multiplying AP-42 emission factors by the maximum allowable amount of natural gas that can be fired in the burner associated with the heater. The maximum heat input capacity of the burner will be 15 mmBtu/hr. Sample emission calculations from the regeneration heater are shown for NO_x. Emissions of other pollutants, including HAPs, are calculated in a similar manner as NO_x.

$$\text{NO}_x [\text{tpy}] = \text{Maximum Annual Natural Gas Usage} \left[\frac{\text{MMscf}}{\text{yr}} \right] \times \text{Emission Factor} \left[\frac{\text{lb}}{\text{MMscf}} \right] \times \left[\frac{\text{ton}}{2,000 \text{ lb}} \right]$$

Applicable Regulations:

The permittee is subject to:

- ▲ *40 CFR 60 Subpart KKK, New Source Performance Standards for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants as incorporated by reference in 401 KAR 60:005.*
- ▲ *40 CFR 60 Subpart VV, New Source Performance Standards for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry as incorporated by reference in 401 KAR 60:005.*
- ▲ *40 CFR 60 Subpart Dc, New Source Performance Standards for Small Industrial-Commercial-Institutional Steam Generating Units.*
- ▲ *401 KAR 60:005, 40 CFR Part 60 Standards for Performance for New Stationary Sources.*
- ▲ *401 KAR 59:015, New Indirect Heat Exchangers.*

Regulations Not Applicable:

- ▲ *40 CFR 64, Compliance Assurance Monitoring.* No emission units at the proposed facility have potential pre-control device emissions of a regulated air pollutant equal or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.
- ▲ *401 KAR 51:017, Prevention of Significant Deterioration of Air Quality.* The Langley facility is located in Floyd County, which is classified as in attainment for all criteria pollutants. Natural gas processing plant is not on the list of 28 PSD source categories defined at 401 KAR 51:001, Section 1 (120)(a)(1)(b) for which the major source threshold is 100 tpy. Thus, the major source threshold for regulated pollutants under the PSD program for the facility is 250 tpy. The facility is not classified as a major source under the PSD program.
- ▲ *40 CFR 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels.* Since the two new NGL product storage tanks will be pressurized and store the NGL liquid product at maximum true vapor pressures that exceed 15 kPa (2.18 psia), this rule will not apply to these tanks.
- ▲ *40 CFR 63, Subpart HH, National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities.* Pursuant to 40 CFR 63.760(b)(2), for area sources of HAPs, the affected source only includes each triethylene glycol (TEG) dehydration unit. Also, pursuant to 40 CFR 63.760(d), an area source that does not contain a TEG dehydration unit will be exempt from the requirements of this rule. The Langley facility does not operate a TEG dehydration unit and will not be subject to the provisions of this rule.

EMISSION AND OPERATING CAPS DESCRIPTION:

NONE

PERIODIC MONITORING:

The permittee shall perform the following periodic monitoring:

- ▲ If the permittee chooses to install a seal system to comply with applicable provisions for compressors, each sensor associated with compressor seal system will be checked daily or will be equipped with an audible alarm.
- ▲ The pressure relief valve will be monitored to confirm the conditions of no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background no later than 5 calendar days after the pressure release.
- ▲ If the closed vent system is constructed of hard-piping, the permittee shall conduct an initial inspection to identify leaks using Method 21 and conduct annual visual inspections for visible, audible, or olfactory indications of leaks.
- ▲ If the closed vent system is constructed of ductwork, the permittee shall conduct initial and annual inspections using Method 21.

OPERATIONAL FLEXIBILITY:

None

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.